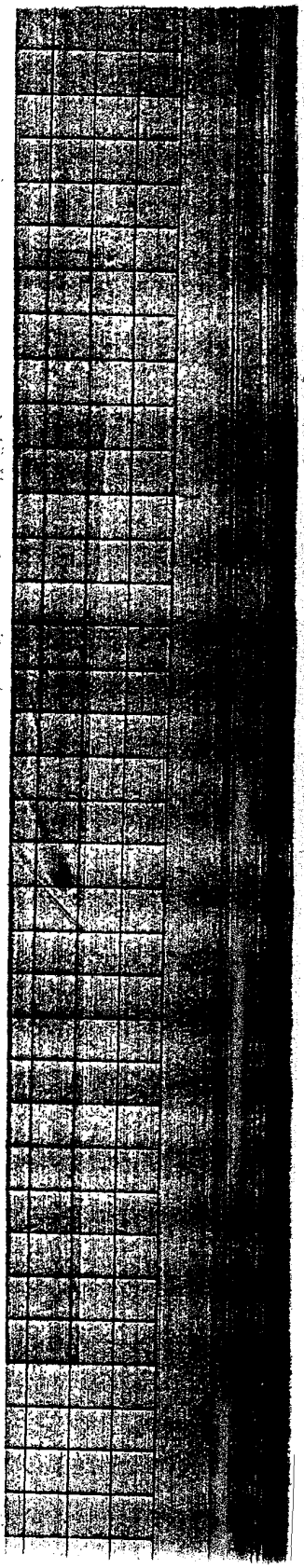
Micromachined Pyro-optical Structure



What is claimed is:

Claim 1: A micromachined pixel structure sensitive to incident photonic radiation comprised of:

*a planer substrate covered with a patterned metallic mirror

* a platform formed above said mirror and substrate by the sacrificial etching away of an initially underlying film and with said platform connected to said substrate by means of tetherbeams of low thermal conductivity

*a pyro-optical film integral to said platform in which the transmission through said pyro-optical film for a topside-incident optical carrier beam is modulated by the temperature of said pyro-optical film

*said pyro-optical film of a controlled thickness so as to form a first Fabry-Perot structure which maximizes the thermal modulation index for said transmissivity

*said platform photonicly-coupled to the underlying metal mirror forming in its entirety a second Fabry-Perot structure which maximizes the absorption of incident radiation within the platform

*and with said metallic mirror containing a transparent transmission path (hole) through to an external photodetector for the optical carrier beam

Claim 2: The pixel of claim 1 where said platform contains a resistive heater element integral to said platform and with electrical interconnections formed within said tether beams to an external source of electrical power for the purpose of controlling the temperature of said platform

Claim 3: An enclosing structure for the purpose of maintaining a partial vacuum surrounding the pyro-optical film.

Claim 4 The pixel of claim 1 with a multiplicity of pixels as in claim 2 arranged into a planer array where the second Fabry-Perot structures are optimized separately to selectively absorb incident low-level irradiation of differing wavelengths

Claim 5 The pixel array of claim 4 containing 3 different pixels each sensitive to a different wavelength range and with the 3 respective pixel types matched structurally so as to modulate a carrier beam onto respective red, blue, and green pixel sites of an aligned CCD or optical-CMOS scanned array for the purpose of imaging 3 different wavelengths

Claim 6:. The pixel of claim 1 wherein an incident, periodically chopped or pulsed low-level radiation is absorbed in said platform causing it's temperature to fluctuate in synchronization with said incident radiation and where the amplitude of an optical carrier beamed onto or through said pyro-optical structure is monitored remotely to the pixel for the purpose of determining the temperature of said platform.

Claim 7: The pixel of claim 1 containing an electrode positioned above the substrate electrode to form an an electrostatic actuator in which the platform is actuated between

contact and no contact positions for the purpose of synchronously The physical contact alternatively couples said platform thermally to the substrate and isolates same platform for sensitivity to the absorbed incident low-level radiation. (The substrate is maintained at a reference temperature. This arrangement eliminates the need for an external mechanical chopper typically employed in infrared sensors. Patent reference 5,486,698 for pyro PZT pixel).

Claim 8.: The pixel of claim 1 where the pyro-optical film is vanadium dioxide

Claim 9 The pixel of claim 8 where the pyro-optical film is maintained at a nominal temperature near 65 degrees Centigrade

Claim 10: The pixel of claim 2 where said heater element is pulsed to cause a thermal dithering or thermal cycling of the temperature of said platform and in time synchronization with the amplitude of said low-level irradiation.

Claim 11: The pixel of claim 1 with a second heater element external to the platform which maintains the substrate at a controlled nominal temperature

Claim 12: The platform of claim 1 including an integral thermistor or pn junction temperature sensor with an interconnect to the substrate plane through said tether beams for the purpose of monitoring and controlling the temperature of said structure through external circuitry.

Claim 13: The pixel of claim1 where the optical carrier is supplied by an external gallium arsenide light emitting diode.

Claim 14: The pixel of claim 1 where said sacrificial layer is polyimide.and said tether beams include silicon dioxide

Claim 15: The pixel array of claim 3 with support posts of individual platforms shared by adjacent pixels thereby reducing the overall substrate area required and increasing the "fill factor"

Claim 16: The pixel of claim 1 with said photodetector integrated into said planer substrate.

Claim 17: The pixel of claim 1 operated within a conventional vacuum chamber enclosure